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CORONA VIRUS INFECTION IN BROILERS (INFECTIOUS BRONCHITIS) VS OSTRICH EGGS ANTIBODIES: MINI REVIEW

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Infectious bronchitis infection is a corona virus infection caused by infectious bronchitis virus. It severely damages the broiler industry, and results in reduced meat production and feed conversion ratio. Present review will provide a brief note on infectious bronchitis virus infection in poultry especially in broilers. Furthermore, this review will provide evidence that ostrich IgY is a powerful weapon against infectious bronchitis infection in poultry farms. Based on previous research and ostrich IgY potential to cure infectious bronchitis it could be assumed that development of antibody vaccines for new type corona viruses, COVID 19, SARS-CoV and MERS-CoV could be beneficial to control new type corona viruses.
Keywords: Corona virus, poultry, respiratory diseases, infection, vaccine.

INTRODUCTION

In the last few decades, broiler production has increased dramatically due to intensive broiler production system. In intensive broiler production system, novel managemental and environmental condition are provided to the broiler for optimum growth. Furthermore, better nutritional plans are adopted to ensure fast growth of broilers. However, intensive production system and higher growth make broiler susceptible to many diseases like infectious bronchitis (IB). Infections bronchitis is primarily a respiratory disease of poultry birds and IB virus firstly infect the respiratory system of poultry birds (Tsukamoto *et al.*,1996a; Tsukamoto *et al.*,1996b; Bacon *et al.*, 2004). After attacking on respiratory system, IB virus spread into other organs of the birds (Tsukamoto *et al.*, 1996a; Bacon *et al.*, 2004). Infectious bronchitis infected birds mortality depend upon the severity of infection and normally death in broilers, chicks and poultry birds occurs due to renal failure in the nephrotropic strain (Albassam *et al.*, 1986; Tsukamoto *et al.*, 1996a; Tsukamoto *et al.*, 1996b; Cavanagh *et al.*, 1997; Tsukamoto *et al.*,1997; Cavanagh *et al.*,1999; Bacon *et al.*,2004). However, in mild and less severe infection of IB virus the respiratory lesions disappear two to three weeks (Bumstead *et al.*, 1989; Ambali and Jones, 1990; Cavanagh *et al.*, 1997; Casais *et al.*, 2005).

Like intensive production system of poultry, livestock production industry has also been shifted towards intensive production system. Similar with poultry industry, livestock industry is also on threat of Bovine coronavirus (BCoV). It has been reported that BCoV has been distributed worldwide (Oma *et al.*, 2016) and known as an important livestock pathogen. Similar with IB virus in broilers, layers, breeders and other poultry birds, it effects the respiratory system of livestock (Boileau and Kapil, 2010). However, similar with BI Virus the BCoV also effect other systems of livestock (Oma *et al.*, 2016). It has been reported that BCoV infect digestive system of calves and cause diarrhea in calves, however, it causes winter dysentery in adult cattle. Due to high infection of BCoV, farmers of large dairy herds face huge economic losses (Boileau and Kapil, 2010). It has also been reported that reducing efforts to control BCoV in dairy animals is against animal welfare (Boileau and Kapil, 2010). To reduce the negative impact of BCoV in dairy animals, horizontal transmission from herd to herd should be avoided. Herd to herd transmission occurs directly or by transferring of live animals from one herd to other (Decaro *et al.*, 2008; Fulton *et al.*, 2011). The other possible reason of transmission of BCoV from herd to herd is traveling of contaminated persons or equipment from one herd to other (Oma *et al.*, 2016). Horizontal transmission could be avoided, if farmers comes to know BCoV shedding and infected animals.

Poultry and livestock producer can avoid the transmission of corona virus species within the flock and herds by avoiding direct contact, transfer of animals, equipment or boosting immunity. This review is focused only on presence of BI virus in broilers flock, their transmission and cure via ostrich egg.

***Spread of IB virus in broiler flocks and mortality in chicks*:**

Transmission of IB virus is horizontal instead of vertical. It has been reported that broiler and other species of poultry are infected from IB virus through inhalation or through contact with contaminated equipment, fomites or poultry litter. Research has also shown that virus could be present on the shell surface of eggs. IB viral infection is highly contagious and have very short incubation period. The typical symptoms of IB virus appear in poultry species within 24-48 hours. Poultry species including broilers and other birds' chicks are more prone to IB virus infection, and severe kind of IB virus infection in chicks cause huge number of mortalities. As the

age of birds increased, they become more resistant and mortality rate due to IB virus is reduced (Smith et al., 1985; Albassam et al., 1986; Ambali and Jones, 1990).

***Effect of IB virus on broilers*:** In broiler production, IB virus infection cause mortality or reduce in weight gain. IB virus infection may also result in poor feed conversion ratio in broilers. Infection during early age may cause more damage as compared to late age infection in broilers.

***Effect on broiler breeders*:** The decline in egg production and egg quality are the major problem on broiler breeder. The IB virus may spread and replicate in the oviduct and may be the reason of permanent impairment of oviduct in pullets or immature female. The infection in immature females, and pullets results in lower number of egg production in overall egg production cycle. Infection of IB virus in mature hens during production results in 10% or more reduction in egg production. Along with reduction in production of mature broilers breeders, the egg shell quality is also deteriorated due to IB viral infection especially malformed egg shells are prominent in this disease and these kind of eggs are more susceptible to breakage due to thin shells (Adachi *et al.,* 2008).

***Flock to flock transmission*:** Flock to flock transmission of IB virus is easy because vaccinating a flock with IB virus living vaccine strain may stay in numerous organs of broilers breeder, poultry breeder, layer and even in broiler (if kept for longer time) for 163 days or longer. The longer stay of IB virus in various organ of poultry species indicate that IB virus may frequently be shed from nasal secretion of birds or excrete from feces of vaccinated birds (Cook *et al.,* 1986). The nasal secretion and feces with IB virus may contaminate litter, equipment or even feathers of other birds; therefore, it is a potential risk within flock or flock to flock contamination.

Protection of broilers by vaccination: In intensive production system, broilers can be protected against various viral diseases including IB viral disease by proper vaccination. It has been reported that antibodies produced in birds after IB virus vaccine provide immunity against IB (Ignjatovic and Galli,1994; Macnaughton *et al*., 1981; Song *et al.,* 1988). However, only antibodies production after vaccine is not a signal of IB virus immunity in IB virus infected birds (Tsukamoto et al., 2018). In a previous study, vaccinated broilers chicks against IB virus showed IB virus antibody in the tears (Gelb *et al*., 1998) but that antibody levels was not sufficient to control IB infection after respiratory challenge with IB virus. Similarly, other researchers also reported that antibodies (produced after results of IB vaccination) are not the only single source of resistance against IB virus (Chubb *et al.,* 1974; Cook *et al.,* 1991). However, several studies reported that maternal-derived antibodies improve the efficacy of the vaccine in poultry birds if the vaccine is of the same type used in the poultry breeder flock immunization (Klieve *et al.,* 1988a; Klieve *et al.,* 1988b; Mockett *et al.,* 1987). Therefore, scope of injecting antibodies to birds for immunization along with vaccination is necessary.

Scope and role of injecting antibodies to birds: In recent years, antibodies are being used frequently for research and therapeutic purposes (Tsukamoto et al., 2018). The origin of antibodies used for research and therapeutic purposes is from experimental mammals, including rabbits and rats. Antibodies originated from mice and rabbits are not suitable for industrial usage because lower production of antibodies from these sources and higher cost of production. However, most recently, avian eggs have been proven excellent source for production of antibodies with applications in research, diagnoses, and immunotherapy (Gross and Speck, 1996; Schade *et al.,* 1991).

The advantage of avian antibodies production have advantages over mammalian antibodies with regard to antigen specificity, and production cost (Schade *et al.,* 1992). It has been reported that the predominant class of immunoglobulin in birds is immunoglobulin yolk (IgY), which is transferred from the blood to the yolk to confer passive immunity to the embryo (Larsson *et al.,* 1993). Recently, ostrich egg produced antibodies was injected in broilers and it has been reported that that antibodies against IB virus from ostrich eggs treated IB infected birds (Tsukamoto et al., 2018). Furthermore, it has been reported that various antigens of IB virus were blocked by IgY of ostrich which may lead to the inactivation of the viral infection of host cells (Tsukamoto et al., 2018). Moreover it, Tsukamoto et al. 2018 reported that mass-production of antibodies by using ostrich eggs is easy as compare to avian eggs because of ostrich egg weight (1.5 kg), size (30-fold bigger than chicken eggs), production cycle (about 60 years) and huge number of eggs per year (100 eggs every year). It has been reported that 4 g of IgY per ostrich egg can be purified and in a year about 400 g of IgY can be obtained from a single ostrich (Adachi et al., 2008; Leslie and Clem, 1969).

***Conclusion*:** It is evident that antibodies against IB virus from ostrich eggs can be produced and used to treat IB virus infection in broilers. Furthermore, ostrich eggs have potential to produce antibodies against IB at commercial scale. Moreover, ostrich egg antibodies have potential to cure other family member of IB virus and new type corona viruses like SARS-CoV and MERS-CoV.

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